Co-funded by the Erasmus+ Programme of the European Union

DigiHealth-Asia

"Capacity Building for Digital Health Monitoring and Care Systems in Asia"

Newsletter 2

June 24, 2023

The aim of the newsletter is to disseminate the project information and developments based on the communications and networking of partner universities of Europe and Asia.

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Overview of the project

Capacity Building for Digital Health Monitoring and Care Systems in Asia (DigiHealth-Asia) is designed to be implemented within a three-year project under EAC-A02-2019-Capacity Building in the field of Capacity Building for Higher Education (CBHE). The focus is to develop and implement digital health courses in three different partner higher education institutions (HEIs) in Pakistan, Thailand, and Mongolia. This multi-country curriculum development project will develop short-cycle (vocational) and Master level digital healthcare courses. Quality Plan is developed in scope of the WP-5 (Management) of the project in compliance with the project description and meeting all the applicable rules and guidelines. Main objectives of the project are:

1. To build capacity in partner HEIs with an aim to develop expertise that would modernize healthcare systems by using digital technologies for health care in assisted living.
2. To develop an education and training program aiming to enhance skills of healthcare practitioners in use of digital and ICT based patient monitoring and assistive technologies.

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3. To create a sustainable network of healthcare practitioners, researchers, academic teaching staff, researchers, and industry professionals, focusing on the development of digital technologies for health care.

Project progress and where we are …

The second plenary meeting of the ERASMUS+ DigiHealth Asia project was hosted by the Thailand partners on January 16-18, 2023, at Mae Fah Luang University in Chiang Rai, and on January 19-20, 2023 at Chiang Mai University. The main objective of the meeting was to discuss the progress of the project's implementation by each partner, as well as the research aspect, and to brainstorm next steps in order to achieve project work packages and ensure sustainable and high-quality implementation of innovative teaching and learning approaches.

At the opening ceremony of the meeting, MFU's president welcomed all project partners and expressed gratitude for the opportunity to host the second plenary meeting. An overview of the project plan and the implementation progress of each work package was presented, and the next plenary meeting plan and project meeting schedule were discussed based on the project's duration and purpose. The partners agreed on a meeting schedule with a clear purpose for each meeting, in order to follow up on the progress of the project plan and ensure the project's success.

Experts and professionals from European universities coordinated and supported the integration of Artificial Intelligence, Embedded Systems, and the Internet of Things into practical applications by creating a graduate training curriculum at the master's level, and implementing pilot cases in each of the Asian partner countries: Thailand, Pakistan, and Mongolia.

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During the meeting, partners shared their progress on the overall architecture, implementation status, research aspect, and next steps of Pilot Cases 1-3. There was also a session of partner group brainstorming, where groups were formed based on the pilot case and the responsibility of research implementation. Each group brainstormed to find solutions to challenging issues related to the project, and discussed the next implementation plan for the project."

What are ongoing …

Pilot Cases Progression and Plan

During the project, partner institutions from Pakistan, Thailand, and Mongolia are working on pilot cases focused on remote monitoring of cardiovascular patients, remote monitoring of mobility disorder patients, and remote consultation of patients, respectively. European partners have been assisting their Asian counterparts on each pilot case to help achieve the project milestones.

Each partner from Asia provided an update on the progress of their overall architecture, implementation status, research aspect, next steps for their assigned pilot case. The progression report for each pilot case can be divided as follows:

Pilot Case 1: Remote monitoring of cardiovascular patients in Pakistan

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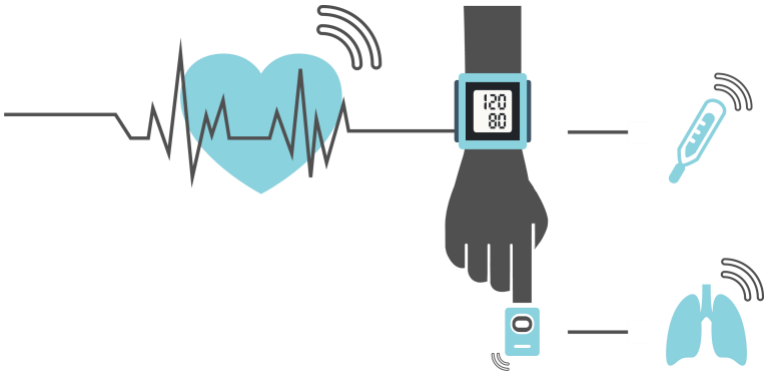
The partners from Pakistan were assigned to Pilot Case 1 - Remote Monitoring of Cardiovascular Patients, led by the Capital University of Science and Technology (CUST) and the National University of Sciences and Technology (NUST). NUST is currently developing a wearable sensor network, edge device, cloud server, and web-based GUI. They have already developed a prototype and have collected ECG data from patients, which has been converted into CSV format and images for further processing.



Additionally, the Capital University of Science and Technology (CUST) has reported progress on their Cardiovascular Monitoring Research and discussed challenges with the University of Ghent (UGent) and the University of Huddersfield (UoH) related to remote monitoring of cardiovascular patients. The collaboration aimed to support the project's success by identifying and solving issues.

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Pilot Case 2: Remote monitoring of mobility disorder patients in Thailand

Chiang Mai University (CMU) and Mae Fah Luang University (MFU) are partners in Thailand who have been assigned to work on Pilot Case 2: Remote Monitoring of Mobility Disorder Patients. CMU and MFU are working on different sub-use cases, with MFU focusing on remoted physical performance assessment and CMU focusing on home exercises, in order to complete their pilot case.

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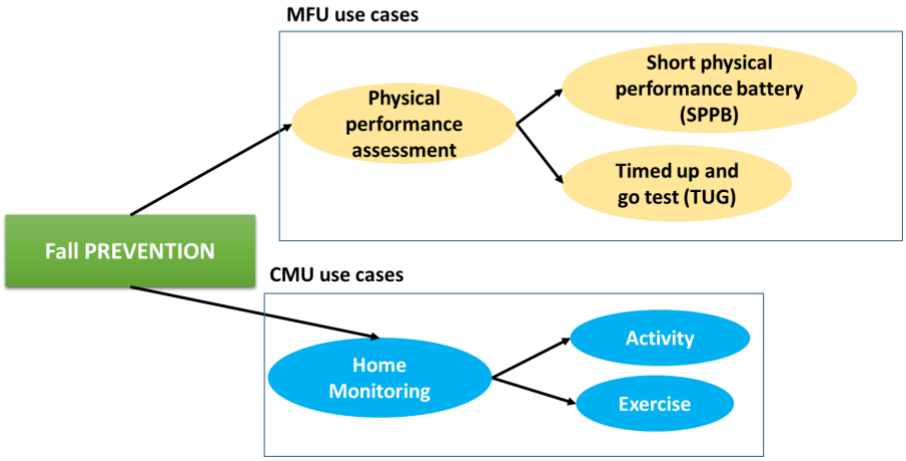
Pilot case 2: Mobility disorder (Fall prevention)



MFU has designed equipment and tested prototypes both internally and externally with elderly individuals in the local area for the purpose of preventing falls in the elderly. The research aspects of MFU include sit-to-stand and balance tests with time series data. MFU is shifting towards using machine learning to detect imbalances between the left and right sides of the body. Additionally, MFU plans to create more prototypes along with an edge layer and conduct AI/ML data analysis.

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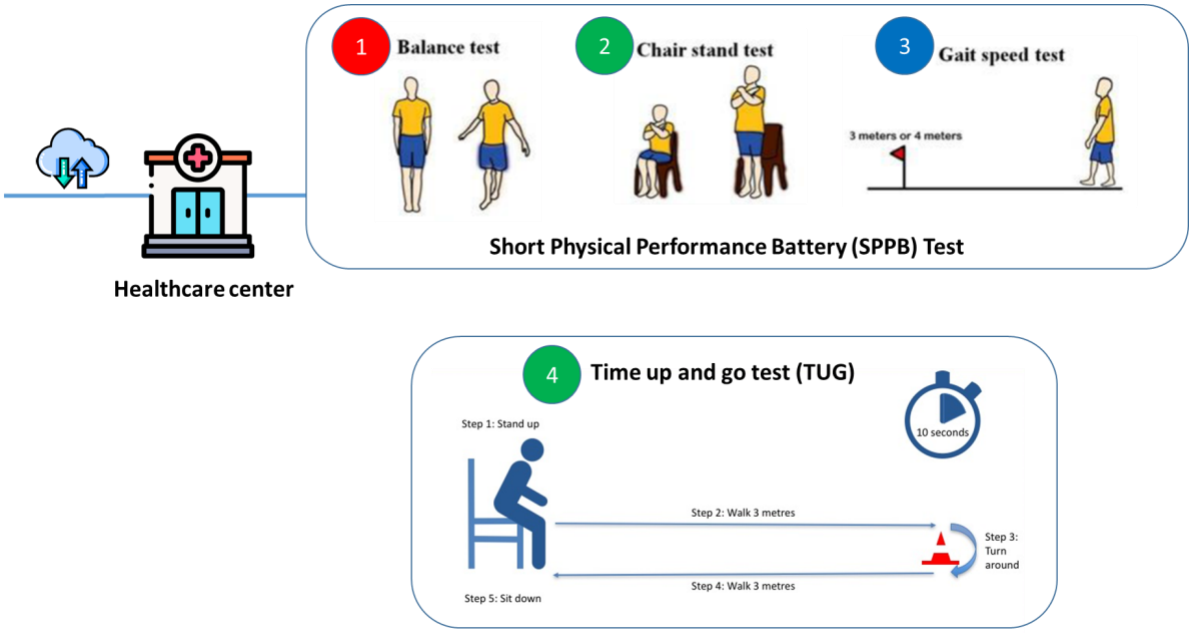

In the home monitoring use case, CMU has designed and selected a posture for a dance exercise for elderly individuals with a 9-step dance to facilitate balance control. The results of testing by a dance expert have also been analyzed by CMU. Furthermore, CMU has produced exercise media production by designing and developing an AI camera, smartwatch, user interface (UI), dashboard, exercise monitoring system, and composing new audio for an edge system to assemble with the posture along with UI tested and selected by elderly users. However, CMU is continuing to produce and develop more in order to ensure the success of the use case.

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The University of Northumbria at Newcastle (UNN), Chiang Mai University (CMU), and Mae Fah Luang University (MFU) have discussed mobility disorder monitoring research with several research challenges, issues, and proposed solutions.

Pilot Case 3: Remote consultation of patients in Mongolia

The partners from Mongolia were assigned to Pilot Case 3 - Remote consultation of patients, led by Mongolian National University of Medical Sciences (MNUMS) and National University of Mongolia (NUM). They are currently focusing on the application of machine learning for early childhood dental caries detection and prevention.

By assistance MNUMS from the Lumière University Lyon 2 (ULL), the NUM team will develop a supervised machine learning model of preliminary dental diagnostics for

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intraoral images and questionnaires. While will contact to the dentist offices for asking them to provide a quality data of patients.

The ULL, MNUMS, and NUM have discussed remote patient consultation research with several research challenges, issues, and proposed solutions.

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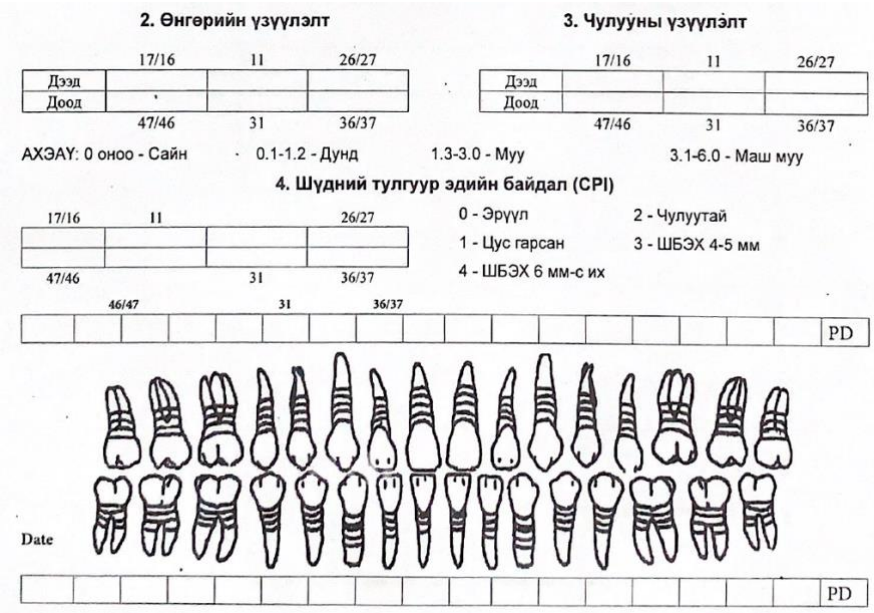

Specialization courses

Those pilot cases will be used in the specialized courses such as IoT for healthcare, AI/ML for healthcare, and embedded systems for healthcare that will be commenced within the project duration at the partner universities in Pakistan, Thailand, and Mongolia. Following the assignment of each Asian partner HEIs, The course accreditation and specialization stream accreditation is presented on the progress of course accreditation optional start date, specialization stream launch date and course accreditation mandator

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launch date, along with updating the course outline by each Asian partner HEIs. The progress of each course were presented and discussed on any issue by consortium to finalizes and giving the positive recommend to the partner who presenting. The presentation of each partner are showing the progress as following below.

Chiang Mai University, CMU

Chiang Mai University (CMU) has made significant strides in its course accreditation and specialization stream accreditation project for the Master of Science in Digital Technology Management degree. The project includes the launch of three new compulsory courses and a specialized stream in digital health. CMU plans to recruit three to five students for the digital health stream, with a best-case scenario of graduation in March 2025. The course accreditation optional start date began in November 2022, and the specialization stream launch date is set to be proposed to the university in May 2023, with mandatory student recruitment in November 2023.

CMU has appointed an external expert committee and submitted the revised curriculum to the graduate school for internal review and revision. The progress made in the project is promising for the development of the digital technology management program and the growth of the digital transformation industry. The project aims to prepare students for careers as digital transformers, digital technology managers, IT managers, data scientists, and more. With the addition of new courses and a specialized stream, students

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will have the opportunity to gain knowledge and skills in emerging digital technologies such as the Internet of Things and artificial intelligence.

Mae Fah Luang University. MFU

Mae Fah Luang (MFU) is actively working on accrediting its specialized courses that will focus on cutting-edge technologies and their applications in healthcare.The three courses that will be offered are IoT for healthcare, AI/ML for healthcare, and Embedded systems for healthcare. The IoT course will teach students how to design and implement IoT-based solutions for healthcare applications, while the AI/ML course will provide an overview of recent advances in AI/ML and their applications in healthcare. The Embedded systems course will cover the design and testing of embedded systems for healthcare applications.

Each course will be worth three U.S. credit hours or six ECTS and will be part of the M.S. Digital Transformation Technology program's specialization stream. In addition to completing these courses, students will also complete a case study on healthcare projects as part of their thesis or independent study. The case study will provide students with the opportunity to apply their knowledge and skills to a real-world healthcare problem and propose innovative solutions.

The accreditation of these courses is an important step towards ensuring that students receive high-quality education and training in digital healthcare technologies. It will also

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help the DigiHealth project achieve its goal of enhancing digital health education and training in Southeast Asia

Capital University of Science and Technology (CUST)

Capital University of Science and Technology (CUST) has shared progress on course and specialization stream accreditation. The process involves proposing and approving new courses or streams at various levels, including the department meeting, Board of Studies, Board of Faculty, and Academic Council.
CUST has proposed a list of elective courses, including "Internet of Things for e-health," "Embedded Systems for Healthcare," and "Artificial Intelligence for Healthcare." The courses are at different stages of approval, with some approved by the Board of Studies and others still under review.
The course outlines for each of the proposed courses were also presented. "Internet of Things for e-health" covers topics such as IoT communication standards, physical principles of sensing, and privacy and security issues related to the Internet of Medical Things. "Embedded Systems for Healthcare" introduces students to embedded technologies, sensors, and actuators, and how to apply them in healthcare devices and smart healthcare solutions. "Artificial Intelligence for Healthcare" covers the fundamentals of AI and machine learning, their applications in healthcare monitoring and evaluation, and the design and evaluation of AI-based healthcare systems. Overall, CUST's efforts to accredit new courses and specialization streams aim to equip students with the knowledge and skills they need to excel in the ever-evolving field of healthcare.

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National University of Sciences and Technology (NUST)

National University of Sciences and Technology (NUST)'s progress towards launching a new degree program/stream/track in MS IoT/IoT Stream/IoT Track. The university has presented a working paper to various committees, including the Faculty Board of Studies, University Curriculum Review Committee, and Academic Council Meeting. After addressing questions raised by the academic directorate, the final decision was made to launch the IoT track as a part of the MS CS program, with an increased student intake from 40 to 70. The IoT track will be offered from spring 2023, with two cross-disciplinary courses, Internet of Things and Artificial Intelligence for Healthcare.

NUST has also presented a tentative plan to launch an IoT stream, which will be presented in the ACM meeting for approval. If approved, the IoT stream will be launched from Fall 2023 or Fall 2024, with the currently optional courses made mandatory. The new program aims to equip students with the necessary skills to excel in the industry, and the courses offered are relevant to current industry needs.

National University of Mongolia (NUM)

National University of Mongolia (NUM) had updated their accreditation progress for the specialization stream which will be under Data Science program. In this program, there

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will be only two courses to be made as mandatory, which is why the Embedded systems course is planned to be made elective. As predicted, this Data Science degree program is expected to start in a Fall 2023.

Mongolian National University of Medical Sciences (MNUMS)

Mongolian National University of Medical Sciences (MNUMS) are working on the certification of their students who enroll an AI for Healthcare course, which will be provided by NUM. Furthermore, MNUMS has also planned to start a vocational training program within their own institute.

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What we have completed

Successful of the 2nd Plenary Meeting in Thailand during 16 - 20 January 2023

On the second plenary meeting of the project, all members of the consortium had joined a meeting in Thailand. There were five days of the meeting which is distinguished to two session of the meeting upon two Thailand host institutes. The first part of the meeting held in Chiang Rai where is a home town of MFU. The second part was held in Chiang Mai, the home city of CMU.

On Monday 16 January 2023, our PM2 meeting started with a warm welcome & logistics from the MFU's president and her executive team. The tokens of appreciation had been presented to the UGent team as the coordinators of this project.

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The PM2 started with a project overview and status presented by the Ugent coordinators. Therefore, the consortium could know their stage of the delivery. Before end of the 1st morning meeting, the MFU president and all delegates from DigiHealth-Asia project had taken a group photo together in front of the president office.

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In the afternoon, our PM2 meeting had been moved to School of Information Technology building for discussing about the progression of each pilot case. Pakistan partners, NUST and CUST, started to present their pilot case 1 status and a plan for further research.

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In the evening, all the partners had joined the cultural tour to sightseeing a famous places in Chiang Rai city.

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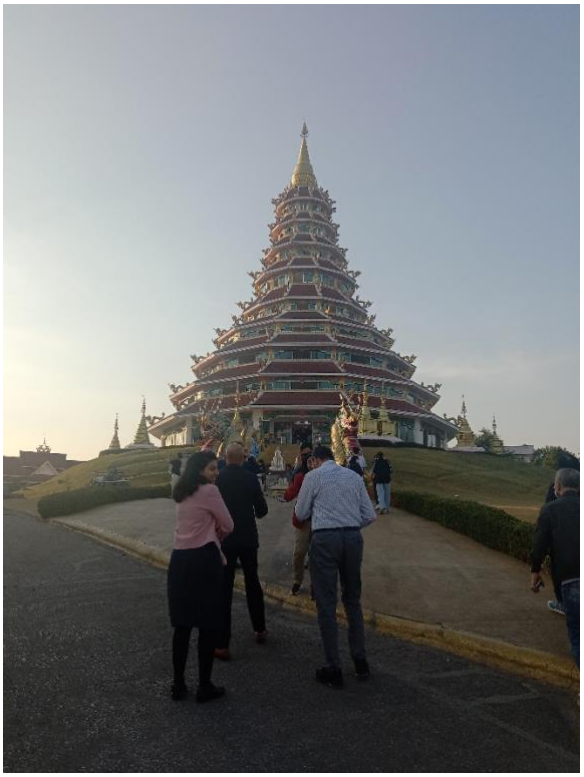

On the second day of the PM2 meeting, the consortium continued to update their progression on the assigned pilot cases. In the morning, MFU and CMU started to present their design and prototype of the monitoring systems. Then, partners had been separated into three small group for discussing a further plan of each pilot cases.

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On Tuesday afternoon of 17 January 2023, the consortium enjoyed the campus tour provided by MFU. We started our tour by visiting the university hospital, the Institute of Thai-Chinese Traditional Medicine Hospital, for monitoring system prototype demonstration. Then we continued to visit the Mekong Basin Civilization Museum and walking around the campus.

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In the evening, after summarizing the 2nd day meeting, the consortium had moved to join a social dinner provide by the host.

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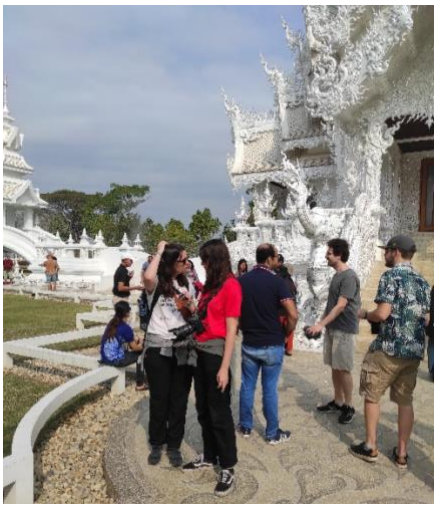
On the third day of the PM2 meeting, our consortium had to leave Chiang Rai and go to Chiang Mai for the second session of PM2 which was held by CMU. On our travel, the delegates had a chance to visit another famous place of Chiang Rai which is Wat Rong Khun (so called White Temple). Then, the team transport to the Doi Chang mountain which is the highest mountain along the way to Chiang Mai. At Doi Chang, we had conducted a 2 hours meeting for discussing about the dissemination and exploitation plan of the project.



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On the way to Chiang Mai, the consortium had stopped by to the Mae Kachan Hot Spring before arriving to the second biggest city in Thailand.

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The second session of the PM2 held on January 19-20, 2023, at Chiang Mai University in Thailand, partners discussed the progress of the project's implementation, including research aspects, and brainstormed next steps to ensure the sustainable and high-quality implementation of innovative teaching and learning approaches.

On the 5th day of the meeting, the partners visited the Chiang Mai University campus, where CMU partners showed how the Gymbot works with a smartwatch as CMU's pilot case for assisting elderly people in doing exercise. CMU is currently developing the smartwatch to work with the Gymbot. The partners also had a chance to visit an elderly care center as a study visit and learn about the CMU Elderly Wellness Center's history from the director.

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Overall, the 2nd plenary meeting of DigiHealth-Asia provided an excellent platform for partners to exchange ideas and share progress, ensuring that the project moves forward effectively and achieves its objectives of modernizing healthcare systems through the use of digital technologies for healthcare in assisted living.

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On January 19th, 2023, the CMU team hosted a partners tour around the CMU campus. In the morning, the team took the partners on a tour of the campus, showing them various buildings, facilities, and landmarks. During the tour, the group stopped to take some group photos to commemorate the occasion. These photos likely capture the partners and the CMU team members together in front of some of the campus's iconic locations. Overall, the tour and photo session were likely a great opportunity for the partners to learn more about the CMU campus and connect with the team members.

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Asst. Prof. Worawit Janchai, Ph.D., the Dean of the College of Arts, Media, and

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Technology, welcoming and gifting a project consortium during a meeting on January 19th, 2023.

The partners visiting the Su Thep Elderly Center on January 20th, 2023. The visit took place in the morning and the Elderly Center team welcomed the partners. During the visit, the Elderly Center team gave a presentation on the center's background, Thai elderly current statistic information, and the solutions implemented by the center to address the current situation.

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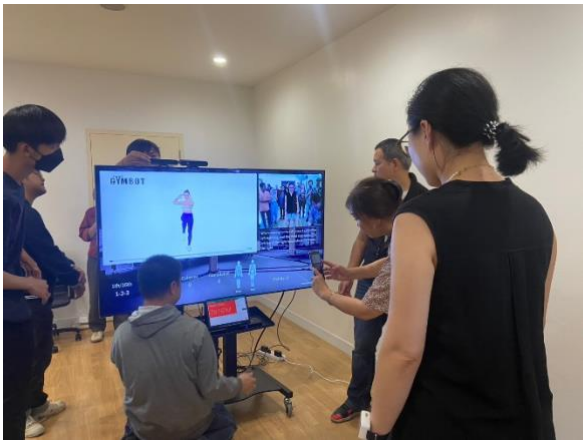

On Jan 20th, 2023, the project partners visited CMU's Elderly Wellness Center, where they were welcomed by Asst. Prof. Sahataya Phaiboonworachart, M.D. During their visit,

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she presented on the center's background, activities, and facilities. The partners were then given a tour of the center, during which the CMU team showcased the Gymbot Prototype, a pilot case for CMU's Digihealth project.

The final activity of the plenary meeting of the project partners on January 20th, 2023, was a wrap-up session and discussion of action points after lunch. The partners

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discussed and planned the next steps of the project tasks and planned the next plenary meeting, which will be held in Pakistan.

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Conferences/workshops/seminars (updated from Sept 2022– Jan 2023)

Conference name: 14th International Conference on Software, Knowledge, Information Management and Applications (SKIMA 2022)

Location: Cambodia University of Technology and Science (CamTech University), Phnom Penh, Cambodia

Date: 02 -04 December 2022

Event: special session, Digital Health Technologies. Erasmus DigiHealth Project.

The International Conference on Software, Knowledge, Information Management and Applications (SKIMA 2022) featured a special session on Digital Health Technologies. The workshop focused on the importance of digital technologies in delivering healthcare services during the Covid-19 pandemic, particularly in primary and secondary care. The session discussed the need for innovations in healthcare to address the increasing demand for limited and expensive resources. The development of smart remote monitoring environments using wireless communication, body area networks, micro and nano devices, machine learning, and computer vision was highlighted as a promising solution.

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The workshop aimed to bring together researchers, academics, healthcare practitioners, and industry experts to exchange ideas and create a sustainable network focused on developing digital technologies for healthcare.

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Publication List: (from Sep 2022 – Jan 2023)

1. S. Wongsila, S. Chernbumroong and P. Sureephong, "Systematic reviews of elderly exercise barriers," *2022 Joint International Conference on Digital Arts, Media and Technology with ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunications Engineering (ECTI DAMT & NCON)*, Chiang Rai, Thailand, 2022, pp. 460-462, doi: 10.1109/ECTIDAMTNCON53731.2022.9720400. https://ieeexplore.ieee.org/document/9720400

2. P. Sureephong, T. Detananporn, S. Chernbumroong and S. Wongsila, "Evaluate the Effectiveness of Fall Prevention Exercise Posture for Elderly," *2022 14th International Conference on Software, Knowledge, Information Management and Applications (SKIMA)*, Phnom Penh, Cambodia, 2022, pp. 298-302, doi: 10.1109/SKIMA57145.2022.10029661. https://ieeexplore.ieee.org/document/10029661

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DigiHealth - Asia Member List

1. University of Ghent, Belgium (coordinator)
Ingrid Moerman
Adnan Shahid
Timo De Waele
2. University of Northumbria at Newcastle, UK
Nauman Aslam
Xiaomin Chen
Shanfeng Hu
3. University of Huddersfield, UK
Qasim Zeeshan Ahmed
Maryam Hafeez
4. Lumière University Lyon 2, France
Giacomo Kahn
5. Capital University of Science and Technology, Pakistan
Amir Qayyum
Fahim Shahzad
6. National University of Science and Technology, Pakistan
Rafia Mumtaz
Syed Ali Hassan
Syed Mohammad Hassan Zaidi
7. Chiang Mai University, Thailand
Pradorn Sureephong
Suepphong Chernbumroong
Suwit Wongsila
Kadeya Thawinwong
8. Mae Fah Luang University, Thailand
Punnarumol Temdee
Worasak Rueangsirarak
Surapong Uttama
Chatchada Sutalangka
Sujitra Arwatchananukul
9. Mongolian National University of Medical Sciences, Mongolia
Ariuntuul Garidkhuu
Amarsaikhan Bazar
10. National University of Mongolia, Mongolia
Mend-Amar Majig
Oyun-Erdene Namsral
Battur Gompil

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